NUCLEAR EXECUTIVE LEADERSHIP TRAINING

U.S. Department of Energy
Integration of Safety into the Design Process

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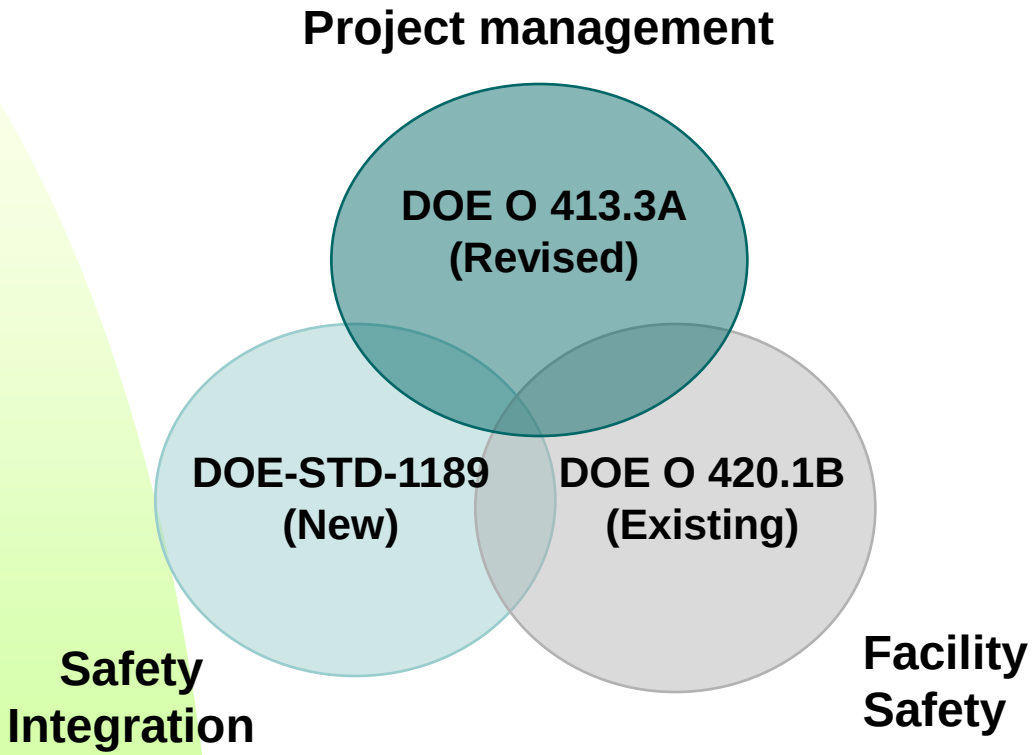
Learning Objectives

- Explain DOE's expectations for integrating safety in design
- Explain the importance of ensuring early integration of safety in design
- Describe line management's responsibilities for integrating safety into design

Project Management with a Safety Focus



Background

- Prior to STD-1189, only a PDSA at CD-3 required
- From 2/15/07 DNFSB report to Congress
  - WTP @ CD-3: seismic, structural, fire protection (70-90%)
  - CMRR@ CD-1: seismic, confinement, fire protection (60%)
  - SWPF@ CD-1: geotechnical, structural, QA (30%)
  - UPF@ CD-0: ARF/RF (10%)

    (Percent design completion)

Late identification of design issues increases costs and schedules

Deputy Secretary Expectations

1. **I expect safety to be fully integrated into design early in the project.**
   - By the start of the preliminary design, I expect a hazard analysis of alternatives to be complete and the safety requirements for the design to be established.
   - I expect both the project management and safety directives to lead projects on the right path so that safety issues are identified and addressed adequately early in the project design.
2. **I expect my line organizations to follow the requirements defined in the project management order and manual.**

Deputy Secretary Expectations (Continued)

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3. I expect line project teams to have the necessary experience, expertise, and training in design engineering, safety analysis, construction, and testing.
4. I expect that the Chiefs of Nuclear Safety will provide safety oversight during the design, construction, and testing phases of our projects.
5. I expect staff work and presentations to the ESAAB to be sufficiently complete so that they highlight tailoring issues and safety issues that need management attention.
6. I expect that we will learn effectively from our project experience so that future projects are more likely to be completed on time and on budget with all mission and safety objectives satisfied.

Introduction to DOE-STD-1189
Integration of Safety into the Design Process

The Standard is intended to address the first of the Deputy Secretary's expectations: "I expect safety to be fully integrated into design early in the project."

- A requirement under DOE O 413.3A for hazard category 1, 2, and 3 nuclear facilities
  - New design and construction
  - Major modifications of existing facilities
- Shows how project management, design, and safety can work together to integrate safety into design
- Defines format and content of safety design basis documents at each design stage
- Includes objective criteria for classification of safety SSCs and seismic classification of SSCs

Conceptual Design Stage Expectations

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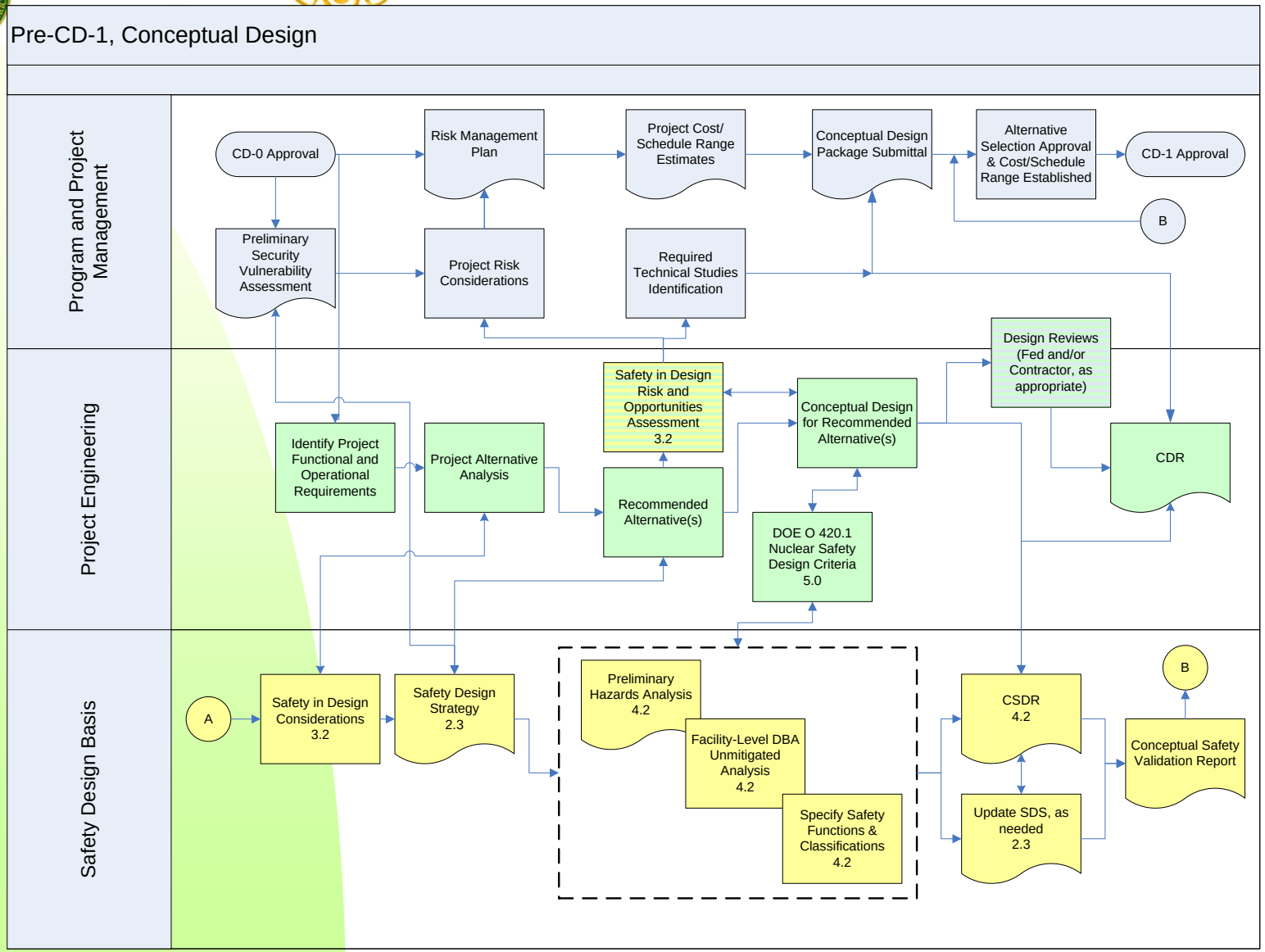
- By the start of the preliminary design, I expect a hazard analysis of alternatives to be complete and the safety requirements for the design to be established.

- I expect both the project management and safety directives to lead projects on the right path so that safety issues are identified and addressed adequately early in the project design.

Flow Chart of Integration



Basis for STD-1189 Development

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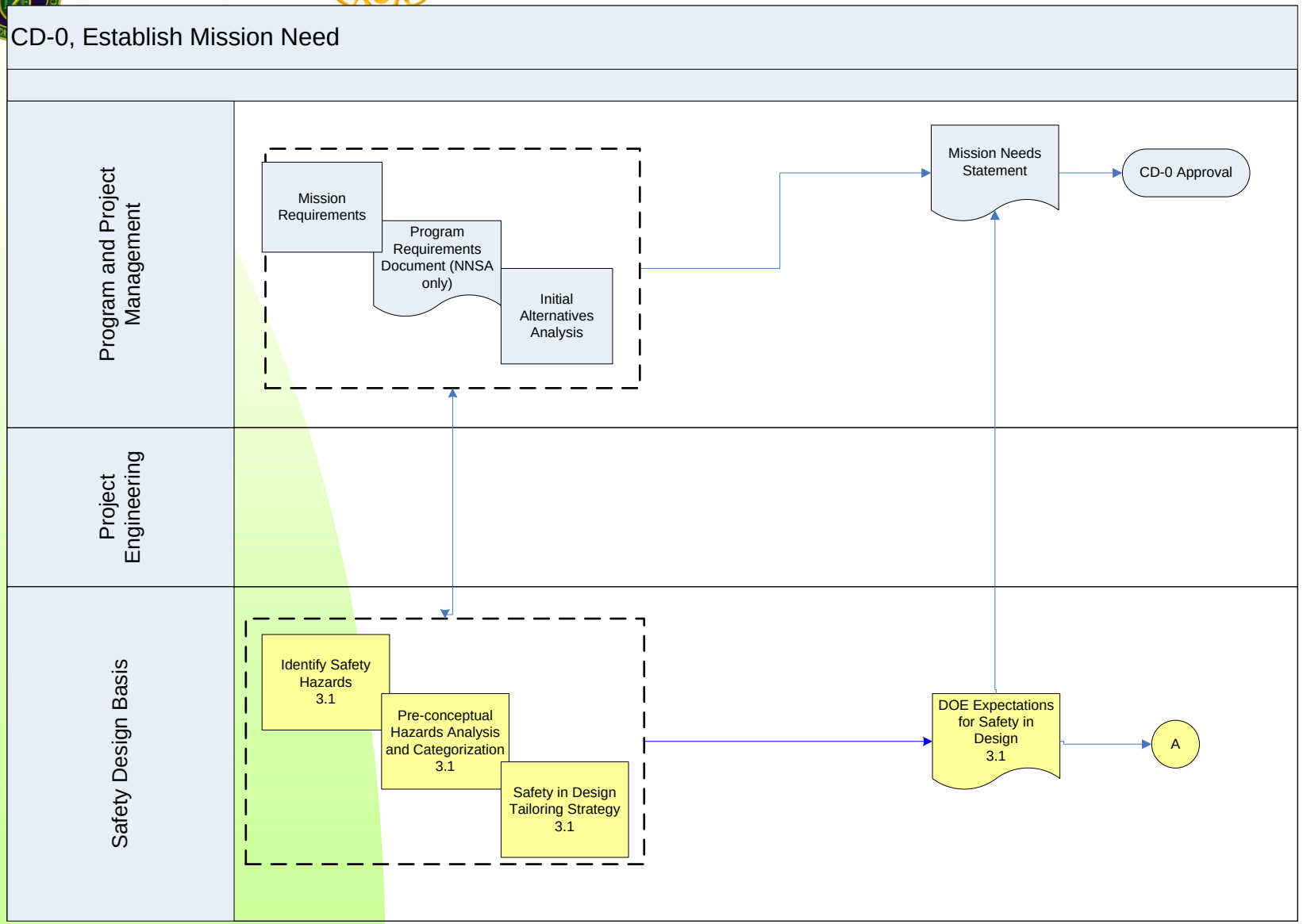
- Analysis of O 413.3A requirements and expectations (also see M 413.3-1)
- E.G., for CD-0:
  - Pre-conceptual planning that focuses on …safety planning and design
  - Mission need statement that …will document the potential hazards and their safety …implications

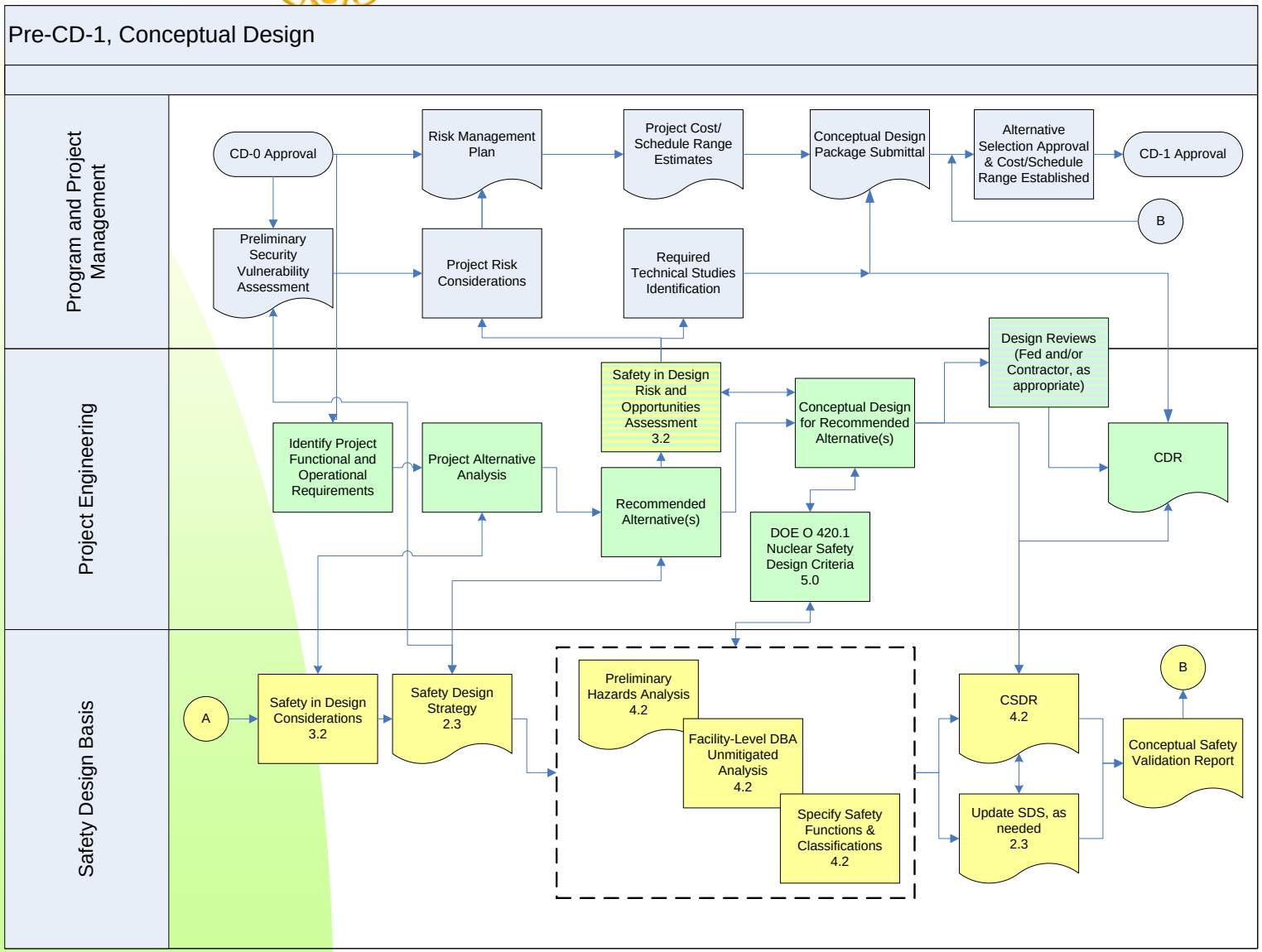
Preconceptual Phase



Basis for STD-1189 Development (continued)

- E.G., for CD-1
  - Prepare a Safety Design Strategy*
  - Prepare a preliminary Project Execution Plan that includes a risk management plan and risk assessment
    - Project cost range estimate
  - Establish an Integrated Project Team
  - Prepare a Conceptual Safety Design Report
  - Conduct a design review:
    - …to determine that the safety documentation is sufficiently conservative and bounding to be relied upon

Conceptual Design Stage



Important Features and Why

- Safety Design Strategy (SDS)
  - Single source for project safety policies, philosophies, major safety requirements, and safety goals to maintain alignment of safety with the design basis during project evolution.
  - For projects that may not follow the traditional project cycle, the SDS provides a vehicle to describe how requirements for safety documentation will be tailored to that particular project approach while satisfying DOE O 413.3A, Chg 1 (tailoring).

Important Features and Why (continued)

- CSDR, PSDR, PDSA
  - These reports and their approvals ensure that the directions and decisions made regarding project safety are explicitly identified and dealt with in early stages of design. The objective is to reduce the likelihood of costly late reversals of design decisions involving safety.
- Safety Design Integration Team (SDIT)
  - The contractor SDIT comprises both safety and design subject matter experts and is the heart of the safety and design integration effort. It supports the Integrated Project Team. Responsible for preparing SDS, CSDR, PSDR, PDSA.

Important Features and Why (continued)

- Objective criteria for safety and design classification of SSCs
  - Mandatory radiological criterion for collocated worker safety significant classification and for Seismic Design Categories
  - Suggested chemical exposure criteria for collocated worker safety significant classification
  - Suggested radiological and chemical exposure criteria for facility worker safety significant classification

Important Features and Why (continued)

- Risk and Opportunities Assessment
  - Input to the Risk Management Plan.
  - Assesses the risks of proceeding at early stages of design on the basis of incomplete knowledge or assumptions regarding safety issues and the opportunities that may arise during preliminary and final design to reduce costs through alternative or refined design concepts or better knowledge regarding the uncertainties
- Major modifications guidance
  - Provides six criteria to aid in the determination of whether a modification is subject to the PDSA requirements of 10 CFR 830.

Roles and Responsibilities

- Safety Design Strategy (SDS)
- Risk & Opportunity Assessment
- Conceptual Safety Design Report (CSDR)
- Conceptual Safety Validation Report (CSVR)
- Preliminary Safety Design Report (PSDR)
- Preliminary Safety Validation Report (PSVR)
- Preliminary Documented Safety Analysis Report (PDSR)

Site Office Impacts

- Staffing of Integrated Project Teams
- Safety Basis Approval Authority (SBAA) and Safety Basis Review Team (SBRT) Staffing
- Project Funding Profiles

Staffing of Integrated Project Teams

- For a major new nuclear facility, expectation is a core full time assignment to the IPT, and to include safety expertise

- Key guidance documents
  - DOE G 413.3-1 (Managing Design and Construction Using Systems Engineering) and
  - DOE G 413.3-18 (Integrated Project Teams)

Safety Basis Approval Authority (SBAA) and Safety Basis Review Team (SBRT) Staffing

- O 413.3A requires PSO appointment of a SBAA no later than CD-0 (at the beginning of the conceptual design phase)
- SBRT
  - Most intensive effort during conceptual design phase
  - SMEs qualified in respective specialized areas
- DOE-STD-1104 revision will contain more explicit requirements and guidance for review and approval of safety design basis documents, including reviewer qualifications

Project Funding Profiles

- Increased emphasis on conceptual design phase
  - Front loads spending profile to support Deputy Secretary's expectations and DOE-STD-1189 requirements and guidance
  - Note that projects in the past have often restricted spending before CD-1 to below the $3 million Congressional notification criterion

Experience to Date

- Y-12
- Others